QUICK LESSON

COVID-19 Coronavirus

Description/Etiology

Coronavirus disease 2019 (COVID-19) is a highly infectious, potentially fatal, acute respiratory infection caused by a novel coronavirus that has been namedSARS-CoV-2.The disease was first identified in December 2019 in Wuhan, a city in Hubei Province in central China, is spreading worldwide, and has been declared a pandemic.Disease severity ranges from mild respiratory illness to severe illness.

SARS-CoV-2 is closely related to SARS-CoV, which caused the severe acute respiratory syndrome (SARS) epidemic in 2003–2004. It likely evolved from a strain found in bats. Whether there was an intermediate host is unclear. Initial COVID-19 cases were linked to a seafood and live animal market in Wuhan, suggesting early cases resulted from animal-to-human transmission. Subsequent person-to-person transmission has been primarily through large respiratory droplets produced by coughing or sneezing. Indirect transmission through contact with contaminated surfaces/objects or exposure to elevated aerosol concentrations in enclosed spaces appears to have been responsible for some infections; however, person-to-person airborne transmission over long distances is unlikely. Transmission by asymptomatic carriers appears possible.

Signs/symptoms develop after an average incubation period of 2–7 days. The most common symptoms are fever, dry cough, and shortness of breath. Complications include respiratory complications (e.g., acute respiratory distress syndrome [ARDS], respiratory failure), infectious complications (e.g., secondary infection, sepsis, septic shock), cardiac complications (e.g., acute cardiac injury, arrythmias), acute kidney injury, liver dysfunction,multiple organ dysfunction/failure,complications of critical illness (e.g., ventilator-associated pneumonia, venous thromboembolism, catheter-related bloodstream infection, pressure injury, stress ulcers), andmortality.

There is no specific antiviral treatment or preventive vaccine. Treatment involves implementing infection control measures and providing supportive care. Infection control measures include implementing standard precautions, contact precautions, and droplet precautions during all patient care; using airborne precautions for aerosol-generating procedures (e.g., intubation, open suctioning of respiratory tract); using appropriate personal protective equipment (i.e., N95 or higher-levelrespirator [facemask is acceptable alternative if respirators are not available], eye/face protection (goggles or face shield), long-sleeved gown, and gloves); ensuring rapid, safe triage of symptomatic patients; promoting patient respiratory hygiene, cough etiquette, and hand hygiene; appropriately placing and isolating patients; and managing visitor access/movement. Supportive care may include symptomatic relief (e.g., antipyretics for fever), respiratory support, fluid management, empiric antimicrobials for sepsis, close patient monitoring for clinical deterioration, and prophylactic measures to reduce risk of complications.

Facts and Figures

A cluster of acute respiratory illness, now known to have been the first cases of COVID-19, first occurred in Wuhan, a city in Hubei Province in central China in December 2019.

As of March 23, 2020, there were 332,930 confirmed cases and 14,510 deaths worldwide. Of these, 81,601 cases and 3,276 deaths occurred in China. Other countries with high numbers of reported cases/deaths include Italy (59,138 cases and 5,476 deaths), the United

Author
Tanja Schub, BS
Cinahl Information Systems, Glendale, CA

Reviewers
Julie Brown
Nurse Excellent

Editor
Diane Hanson, MM, BSN, RN, FNAP

March 27, 2020

States (33,404 cases and 400 deaths), and Iran (21,638 cases and 1,685 deaths). (World Health Organization, 2020b, Centers for Disease Control and Prevention, 2020c)

The first 2 cases in the United States were reported on January 14, 2020. Of the 33,404 cases reported in the United States as of March 23, 2020, 449 were classified as travel-related, 539 were the result of close contact with infected persons in the United States, and 32,416 were under investigation. (Centers for Disease Control and Prevention, 2020c)

Although most patients (81%) develop mild illness, 14% develop severe disease that requires hospitalization and oxygen support, and 5% require ICU admission. (World Health Organization, 2020a)

The average infected person transmits the virus to 2.2-3.6 other people. (Li et al., 2020; Lai et al, 2020)

Risk Factors

Risk factors for developing COVID-19 include residing in or traveling to an area with widespread sustained transmission of SARS-CoV-2; and living with, being intimate partner of, providing care to, or having other close contact(i.e., being within approximately 6 feet/2 m) for a prolonged period or having direct contact with direct secretions) with a person with COVID-19.

Possible risk factors for severe illness include older age, underlying medical conditions (e.g., cardiovascular disease, chronic respiratory disease, diabetes mellitus, hypertension, cancer, liver disease, immunocompromise, or pregnancy), secondary infection, elevated inflammatory indicators (e.g., C-reactive protein), and history of smoking.

Signs and Symptoms/Clinical Presentation

Signs and symptoms develop after an average incubation period of 2-7 days. Commonmanifestations include fever (may be prolonged or intermittent), dry cough, muscle aches, fatigue, and shortness of breath. Less common signs and symptoms include sore throat, headache, confusion, cough with sputum production and/or hemoptysis, chest pain, diarrhea, nausea, and vomiting. Lab abnormalities may include leukopenia, leukocytosis, lymphopenia, prolonged prothrombin time, and elevated liver enzymes.

Clinical presentation tends to be less severe in children than in adults. Signs and symptoms are typically limited to fever and cough.

Assessment

› **Patient History**
- Ask about recent travel, especially to areas of sustained, widespread COVID-19 transmission
- Inquire about history of close contact with a confirmed COVID-19patient

› **Physical Findings of Particular Interest**
- Fever has been reported in 83–99% of patients

› **Laboratory Tests That May Be Ordered**
- Blood tests such as CBC, blood cultures, liver enzymes, lactate dehydrogenase, muscle enzymes, and C-reactive protein
- Routine tests for other respiratory pathogens including influenza virus
- Real-time RT-PCR testing using upper respiratory tract specimens (nasopharyngeal swab and possibly oropharyngeal swab) and lower respiratory tract specimens, if available, to diagnose

› **Other Diagnostic Tests/Studies**
- Chestx-ray orcomputed tomography (CT) scan to assess for bilateral involvement (more than 75% of cases) with multiple areas of consolidation and ground glass opacities

Treatment Goals

› **Implement Infection Control Measures to Prevent Further Disease Transmission**
- Apply standard and transmission-based precautions (droplet or airborne). Use airborne precautions for aerosol-generatingprocedures
- Perform hand hygiene (using alcohol-based hand rub containing at least 60% alcohol or by washing hands with soap and water for at least 20 seconds) before and after all patient contact, contact with potentially infectious material, before putting on PPE, and after removing PPE
- Use PPE including an N95 or higher-level respirator (facemask is acceptable alternative if respirators are not available), eye/face protection (goggles or face shield), long-sleeved gown, and gloves

Figure 1: PPE. Copyright© 2020, EBSCO Information Services.

Figure 2: NIOSH-Approved N95 Respirator. Copyright ©2016, EBSCO Information Services

- If possible, place admitted patient in single-person room with dedicated bathroom and closed door. Avoid room transfers during patient stay, if possible
- Limit patient transport/movement outside room. Perform procedures/tests in room, when possible
  - Place facemask on patients that require transportation out of room. Ensure the transporter wears a facemask for anything more than a brief encounter
- Avoid/minimize aerosol-generating procedures. If one must be performed, apply airborne precautions.Limit attendees to health care providers essential for procedure and ensure all present wear N95 or higher-level respirator and other appropriate PPE. Do not allow visitors to be present. Ideally perform procedure in Airborne Infection Isolation Room (AIIR)

- Manage visitor access/movement. Ensure visitors perform hand hygiene and follow respiratory hygiene and cough etiquette precautions, screen for signs/symptoms before entry, inform about need to wear PPE, limit and screen visitors to most vulnerable patients, encourage alternatives to in-person visits (e.g., video calls), and maintain record of all persons entering room
- Ensure appropriate cleaning and surface decontamination of room after patient discharge or transfer from room

› **Provide Supportive Care to Promote Optimum Physiologic Status and Reduce Risk of Complications**

- Closely monitor vital signs, breath sounds, pulse oximetry, ABG values, and respiratory and fluid status
- Provide symptomatic relief (e.g., antipyretics for fever), as ordered
- Initiate supplemental oxygen for patients with respiratory distress, hypoxemia, or shock
  - For patients with acute respiratory distress syndrome (ARDS), assistwith endotracheal intubation, ensuring adherence to airborne precautions during procedure, and initiate/monitor mechanical ventilation
  - Initiate prone ventilation for 12-16 hours per day, if ordered
  - Assist with extracorporeal membrane oxygenation (ECMO), if ordered
- Closely monitor patient for signs of clinical deterioration, including rapidly progressive respiratory failure and sepsis. Initiate prescribed supportive care measures immediately
- Initiate prophylactic measures to prevent complications of critical illness
  - Use ventilator weaning protocols, minimize sedation, position patient semi-recumbent, use a closed suctioning system, periodically drain and discard tube condensate, and use a new circuit for each patient to reduce risk of ventilator-associated pneumonia
  - Administer prescribed anticoagulants (e.g., low-molecularweight heparin), as ordered, and/or apply intermittent pneumatic compression devices to reduce risk of venous thromboembolism
  - Use sterile technique during IV catheter insertion and remove when no longer needed to reduce risk of catheter-relatedbloodstream infection
  - Turn patient every 2 hours to reduce risk of pressure injury
  - Provide early enteral nutrition and administer prescribed histamine-2 blocker or proton pump inhibitor, as ordered, to reduce risk of stress ulcer
  - Encourage early mobilization, as patient condition permits, to reduce ICU-related weakness
- Monitor patient for development of septic shock. Assist with resuscitation efforts, as ordered, including administering antimicrobial therapy, IV fluids (i.e., bolus normal saline or Ringer's lactate), and vasopressors (e.g., norepinephrine, EPINEPHrine)

› **Provide Emotional Support and Educate**

- Assess patient/family member anxiety level and coping ability; provide emotional support and educate about COVID-19, potential complications, supportive care benefits, and individualized prognosis
- As appropriate, request referral to the hospital chaplain, a clergyperson, or a mental health clinician for supportive counseling on coping with a potentially life-threatening condition

Food for Thought

› Most human coronaviruses cause mild respiratory infections, such as the common cold.However, in recent years, epidemics of severe acute respiratory syndrome coronavirus (SARS-CoV) and Middle East respiratory syndrome coronavirus (MERS-CoV), resulted in more than 10,000 total cases and mortality rates of 10% and 37%, respectively (Gerber et al., 2016; Huang et al., 2020)

› Although SARS-CoV-2 has been found in patient stools, whether fecal-oraltransmission is possible is unclear (Lai et al., 2020;Tesini, 2020)

› A number of possible treatments for COVID-19 are currently under investigation, including the antimalarial drug chloroquine (World Health Organization, 2020e)

Red Flags

› The appropriate health department should be notified immediately of patients with suspected COVID-19. Public health staff will help determine if testing is warranted and coordinate testing

› Health care clinicians caring for patients with known or suspected COVID-19must immediately implement standard precautions, contact precautions, and droplet precautions, and apply airborne precautions for aerosol-generatingprocedures

› PPE must be used during all patient care activities. This includes an N95 or higher-level respirator (facemask is acceptable alternative if respirators are not available), eye/face protection (goggles or face shield), long-sleeved gown, and gloves

› Patient isolation measures, whether in the home or in a health care setting, are important to prevent spread of COVID-19
› Patients with mild clinical presentation may experience clinical deterioration during the second week of illness. Patient monitoring for progression to lower respiratory tract disease is imperative

What Do I Need to Tell the Patient/Patient's Family?

› Provide information about signs and symptoms of COVID-19, the most common of which are fever, dry cough, and shortness of breath
› Teach patients ways to protect themselves from contracting COVID-19, such as by:
  • Frequent handwashing with soap and water for at least 20 seconds or hand sanitizer containing at least 60% alcohol, especially after contact with ill people or being in a public place
  • Avoiding touching face, eyes, and mouth with potentially contaminated hands
  • Cleaning and disinfectingfrequently touched surfaces (e.g., countertops, tables, doorknobs, phones) daily
  • Avoiding close contact with people with acute respiratory infections
  • Social distancing (i.e., avoiding congregate settings and mass gatherings, and maintaining distance of approximately 6 feet/2 meters from others when possible) in areas of community spread
› Educate about strategies for early detection and preventing further transmission, such as:
  • Isolation, quarantine, controlled travel, active monitoring, self-monitoring with public health supervision, self-monitoring,self-observation, or social distancing depending on assessed risk level and whether symptoms are present
  • Seeking health care advice if signs and symptoms (e.g., fever or cough) develop to determine if medical evaluation is needed
  • Protecting others if you are potentially infected by staying home, practicing respiratory hygiene and cough etiquette, and wearing a facemask while around others

Figure 3: Cough Etiquette. Copyright© 2020, EBSCO Information Services.

› Provide patient education resources, if available, to reinforce verbal education

References

1. Cai, J., Sun, W., Huang, J., Gamber, M., Wu, J., & He, G. (2020). Indirect virus transmission in cluster of covid-19 cases, Wenzhou, China, 2020. *Emerging Infectious Diseases*, *26*(6). doi:10.3201/eid2606.200412 **(R)**
2. Cascella, M., Rajnik, M., Cuomo, A., Dullebohn, S. C., & Di Napoli, R. (2020, March 8). Features, Evaluation and Treatment Coronavirus (COVID-19). *StatPearls [Internet]*. Treasure Island, FL: StatPearls Publishing. **(GI)**
3. Centers for Disease Control and Prevention. (2020, March 6). Coronavirus Disease 2019 (COVID-19): Clean & Disinfect: Interim Recommendations for US Households with Suspected/Confirmed Coronavirus Disease 2019. Retrieved March 16, 2020, from https://www.cdc.gov/coronavirus/2019-ncov/prepare/cleaning-disinfection.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fcommunity%2Fhor **(G)**
4. Centers for Disease Control and Prevention. (2020, March 14). Coronavirus Disease 2019 (COVID-19): How to Protect Yourself. Retrieved March 16, 2020, from https://www.cdc.gov/coronavirus/2019-ncov/prepare/prevention.html **(G)**
5. Centers for Disease Control and Prevention. (2020, March 23). Coronavirus Disease 2019 (COVID-19): cases in the U.S. Retrieved March 23, 2020, from https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/cases-in-us.html **(GI)**
6. Centers for Disease Control and Prevention. (2020, March 4). Evaluating and Testing Persons for Coronavirus Disease 2019 (COVID-19). Retrieved March 16, 2020, from https://www.cdc.gov/coronavirus/2019-ncov/hcp/clinical-criteria.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fclinical-criteria.html **(G)**
7. Centers for Disease Control and Prevention. (2020, March 7). Interim Clinical Guidance for Management of Patients with Confirmed Coronavirus Disease (COVID-19). Retrieved March 16, 2020, from https://www.cdc.gov/coronavirus/2019-ncov/hcp/clinical-guidance-management-patients.html **(G)**
8. Centers for Disease Control and Prevention. (2020, March 13). Interim Guidelines for Collecting, Handling, and Testing Clinical Specimens from Persons Under Investigation (PUIs) for Coronavirus Disease 2019 (COVID-19). Retrieved March 16, 2020, from https://www.cdc.gov/coronavirus/2019-nCoV/lab/guidelines-clinical-specimens.html **(G)**
9. Centers for Disease Control and Prevention. (2020, March 10). Interim Infection Prevention and Control Recommendations for Patients with Suspected or Confirmed Coronavirus Disease 2019 (COVID-19) in Healthcare Settings. Retrieved March 16, 2020, from https://www.cdc.gov/coronavirus/2019-ncov/infection-control/control-recommendations.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fhcp% **(G)**
10. Centers for Disease Control and Prevention. (2020, March 7). Interim US Guidance for Risk Assessment and Public Health Management of Persons with Potential Coronavirus Disease 2019 (COVID-19) Exposures: Geographic Risk and Contacts of Laboratory-confirmed Cases. Retrieved March 16, 2020, from https://www.cdc.gov/coronavirus/2019-ncov/php/risk-assessment.html **(G)**
11. Chen, N., Zhou, M., Dong, X., Qu, J., Gong, F., Han, Y., & Zhang, L. (2020). Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: A descriptive study. *Lancet (London, England)*, *395*(10223), 507-513. doi:10.1016/S0140-6736(20)30211-7 **(R)**
12. Corman, V. M., Landt, O., Kaiser, M., Molenkamp, R., Meijer, A., Chu, D. K., & Drosten, C. (2020). Detection of 2019 novel coronavirus (2019-nCoV) by real-time RT-PCR. *Eurosurveillance*, *25*(3). doi:10.2807/1560-7917.ES.2020.25.3.2000045 **(R)**
13. Coronaviridae Study Group of the International Committee on Taxonomy of Viruses. (2020). The species Severe acute respiratory syndrome-related coronavirus: Classifying 2019-nCoV and naming it SARS-CoV-2. *Nature Microbiology*, *Advanced online publication*. doi:10.1038/s41564-020-0695-z **(RV)**
14. Gerber, S. I., & Anderson, L. J. (2016). Coronaviruses. In L. Goldman & A. I. Schafer (Eds.), *Goldman-Cecil medicine* (25th ed., Vol. 2, pp. 2199-2201). Philadelphia, PA: Elsevier Saunders. **(GI)**
15. Huang, C., Wang, Y., Li, X., Ren, L., Zhao, J., Hu, Y., & Cao, B. (2020). Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet (London, England)*, *395*(10223), 497-506. doi:10.1016/S0140-6736(20)30183-5 **(R)**
16. Lai, C. -C., Shih, T. -P., Ko, W. -C, Tang, H. -J., & Hsueh, P. -R. (2020). Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and coronavirus disease-2019 (COVID-19): The epidemic and the challenges. *International Journal of Antimicrobial Agents*, *55*(3). doi:10.1016/j.ijantimicag.2020.105924 **(RV)**
17. Li, Q., Guan, X., Wu, P., Wang, X., Zhou, L., Tong, Y., & Feng, Z. (2020). Early transmission dynamics in Wuhan, China, of novel coronavirus-infected pneumonia. *New England Journal of Medicine*, *Advanced online publication*. doi:10.1056/NEJMoa2001316 **(R)**
18. Liu, W., Tao, Z. -W., Lei, W., Ming-Li, Y., Kui, L., Ling, Z., & Yi, H. (2020). Analysis of factors associated with disease outcomes in hospitalized patients with 2019 novel coronavirus disease. *Chinese Medical Journal*, *Advanced online publication*. doi:10.1097/CM9.0000000000000775 **(R)**
19. Paraskevis, D., Kostaki, E. G., Magiorkinis, G., Panayiotakopoulos, G., Sourvinos, G., & Tsiodras, S. (2020). Full-genome evolutionary analysis of the novel corona virus (2019-nCoV) rejects the hypothesis of emergence as a result of a recent recombination event. *Infection, Genetics and Evolution: Journal of Molecular Epidemiology and Evolutionary Genetics in Infectious Diseases*, *79*(104212). doi:10.1016/j.meegid.2020.104212 **(R)**
20. Rothe, C., Schunk, M., Sothmann, P., Bretzel, G., Froeschl, G., Wallrauch, C., & Hoelscher, M. (2020). Transmission of 2019-ncov infection from an asymptomatic contact in Germany. *New England Journal of Medicine*, *382*(10), 970-971. doi:10.1056/NEJMc2001468 **(C)**
21. Ruan, Q., Yang, K., Wang, W., Jiang, L., & Song, J. (2020). Clinical predictors of mortality due to COVID-19 based on an analysis of data of 150 patients from Wuhan, China. *Intensive Care Medicine*, *Advanced online publication*. doi:10.1007/s00134-020-05991-x **(R)**
22. Tang, B., Bragazzi, N. L., Li, Q., Tang, S., Xiao, Y., & Wu, J. (2020). An updated estimation of the risk of transmission of the novel coronavirus (2019-nCov). *Infectious Disease Modelling*, *5*, 248-255. doi:10.1016/j.idm.2020.02.001 **(R)**
23. Wang, D., Hu, B., Hu, C., Zhu, F., Liu, X., Zhang, J., & Peng, Z. (2020). Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan, China. *JAMA: Journal of the American Medical Association*, *Advanced online publication*. doi:10.1001/jama.2020.1585 **(R)**
24. World Health Organization. (2020, March 13). Clinical management of severe acute respiratory infection when novel coronavirus (nCoV) infection is suspected. Interim guidance. Retrieved March 16, 2020, from https://www.who.int/publications-detail/clinical-management-of-severe-acute-respiratory-infection-when-novel-coronavirus-(ncov)-infection-is-suspected **(G)**
25. World Health Organization. (2020, March 23). Coronavirus disease 2019 (COVID-19) Situation Report – 63. Retrieved March 24, 2020, from https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200323-sitrep-63-covid-19.pdf?sfvrsn=d97cb6dd_2 **(GI)**
26. World Health Organization. (2020, January 25). Infection prevention and control during health care when novel coronavirus (nCoV) infection is suspected. Interim guidance. Retrieved March 16, 2020, from https://www.who.int/publications-detail/infection-prevention-and-control-during-health-care-when-novel-coronavirus-(ncov)-infection-is-suspected-20200125 **(G)**
27. World Health Organization. (2020, March 2). Laboratory testing for 2019 novel coronavirus (2019-nCoV) in suspected human cases. Interim guidance. Retrieved March 16, 2020, from https://www.who.int/publications-detail/laboratory-testing-for-2019-novel-coronavirus-in-suspected-human-cases-20200117 **(G)**
28. World Health Organization. (2020, March 13). WHO R&D Blueprint. COVID-1. Informal consultation on the potential role of chloroquine in the clinical management of COVID 19 infection. Retrieved March 24, 2020, from https://www.who.int/blueprint/priority-diseases/key-action/RD-Blueprint-expert-group-on-CQ-call-Mar-13-2020.pdf?ua=1 **(RV)**